

STUDY OF EVENNESS PROPERTIES OF CERTAIN INDIAN WOOL AND WOOL POLYESTER BLENDED YARNS

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ABSTRACT

The Indian Bellary breed sheep and Hassan breed sheep wool is courser in nature. The Indian Bellary breed sheep and Hassan breed sheep woolen fibers are used to produce hand spun yarns. The Bellary breed wool is blended with polyester fibers to make blended yarn. The regular woolen yarns produced by the local hand spinners are studied. The effect of blend on Bellary breed wool with polyester is also studied. The study showed that the count, twist, uniformity and hairiness of yarn are not varied much in Wool polyester blended hand spun yarn.

KEYWORDS: Bellary breed wool, Hassan breed wool, Polyester, Hand spinning, Uniformity of yarn & Hairiness

Received: Sep 01, 2017; **Accepted:** Sep 21, 2017; **Published:** Oct 21, 2017; **Paper Id.:** IJTFTOCT20174

INTRODUCTION

The Woolen yarns produced by hand spinners in some villages of south India, are of 100% woolen yarns used to make Woolen blankets. Woolen blankets weavers of villages are not earning much profits, because the woolen blankets produced by the weaver are of inferior quality which cannot be marketable to the other sector. The blankets are not to expect durability and having no value addition. Hence the attempt has been made to produce wool, polyester blended yarn.

Wool Fiber

The wool fiber is growing from a root located in the follicle in the Dermis. Dermis is the middle layer of the skin. Wool is the keratinized protein, fiber extended above the skin. Keratinized fibers are dead tissues. The pigments presents in wool fibers are more common in primitive breeds. Most of the primitive breed's wool is used for carpet wool types. Wool is a Natural, Renewable and sustainable fiber. Due to wool's natural crimp and high bulk, it traps lots of air. Wool is a hygroscopic fiber, and it is able to absorb and desorbs moisture vapor as condition changes, it is breathable fiber. Wool contains high level of nitrogen and sulfur, which are natural fire retardants, so it is difficult to ignite.

Wool fibers consist of various Amino acids with various side groups, Inherent groups (Glycine, Alanine, Valine, Leucine, Isoleucine, Phenylalanine), Acidic group (aspartic acid and glutamic acid), Basic groups (Lysine and Arginine and Histidine), Hydroxyl group (Serine, Threonine, and Tyrosine), Ring group (proline), Double bond sulfur group (Cystine), Miscellaneous groups (Methionine and Tryptophan) (W. E. Morton and J.W.S.Hearle.2008). Density of wool fiber is 1.3 g/ Cm³ (Ford J.F 1966).

Yarn Uniformity of a yarn is very determined by the average number of fibers in the cross section, the finer the fibers the more uniform is the yarn. Improved yarn uniformity is a desirable characteristic in its own right on the appearance (Spencer Smith 1947).

Explain the sequence of the process of producing the woolen yarn on the woolen spinning system like batching, oiling, carding, condensing, and spinning etc. (Pokharna A.K. 2003), but in rural areas the spinners do not use any such sophisticated process methods to produce yarns.

Development of cored wool/polyester blends yarns and their evaluation in fabrics (Robert W. Singleton 1980). 64 s (22 μ) grade top wool and Terylene are used to produce yarns. Yarns produced are tested and evaluated. And from the same yarns knitted fabrics are produced, tested and evaluated and observed 65/35 wool: polyester fabric shown high tearing and bursting strength than the control sample (100% wool) fabric. Most of the work is done on machine spun yarns and are very finer quality yarns.

MATERIALS AND METHOD

In this Research, Mainly three type materials used are wool fibers, and Polyester fibers. Wool fibers used are of two breed Fibers of Bellary breeds Black color, Mixed Color Bellary breeds wool, Hassan breed white/yellowish wool, and Polyester.

South Indian Sheep Breeds Wool Fibers

South Indian breed wool used

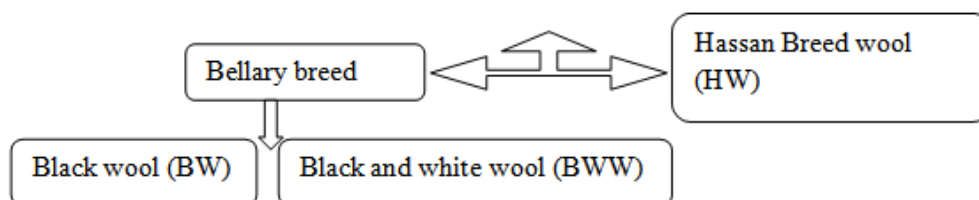


Figure: 1 BW



Figure: 2 BWW



Figure: 3 HW

Polyester Fiber

Polyester fibers are used to blend with wool to produce the wool polyester blended yarn. Density of Polyester fiber is 1.39 g/ Cm³ (Ford J.F 1966).

Specification of polyester fiber: Fiber Diameter-15 Den, Fiber Hallow-20%, And fiber Length-66 mm, Type: Non silicate, Crimp: 32 crimps for 64 mm, Supplier of Fiber: Alliance fiber Ltd.

METHODOLOGY

Wool fiber is collected from the formers and shepherds which is shear by the scissors. The fibers collected are sorted according to the color of the wool and cleaned manually. The manually sorted and cleaned wool is fed into the Wool opener machine. The wool is opened and cleaned further by the opener machine. The 30% wool is mixed with 70% wool for the wool blended yarn (W2PH). The tufts of 100% wool are taken for spinning for produce W1, W2, and W3 yarns. All the tufts are spun on Charka (Type of hand spinning) for making yarns.

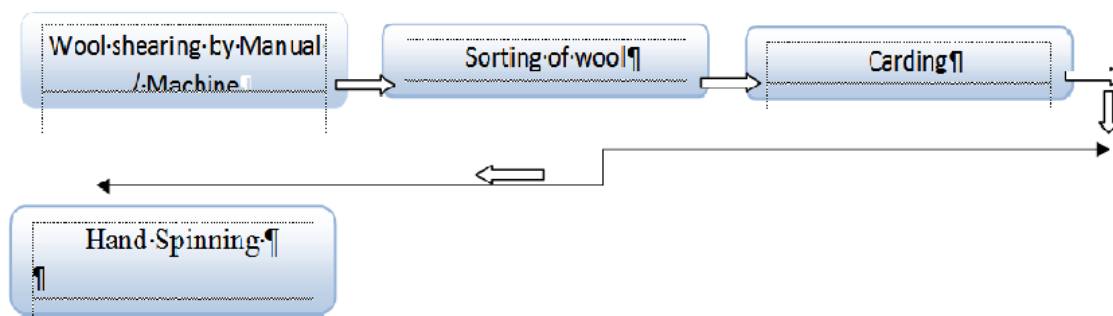


Figure.4: Process Design: Process Flow Chart of Producing Woolen Yarns

Yarn properties

Yarn Linear density

Linear density is one of the most important properties to measure the quality of a yarn. Linear density of yarn is also called yarn count expressed in Length per unit weight or weight per unit length (ASTM-D-1059-01). A Tex system of yarn counting is commonly used. A Tex denotes unit of linear density equal to the mass in grams 1000 meters of length of textile yarns, roving or slivers (Saville. B.P, 1999). Standard test method ASTM-D-1059-01 is used to measure the yarn count.

Yarn Twist

The force is introduced axially to the fibers or filament stands hold together to make a firm textile strand called twisting. Twist contributes strength to the yarn. When the twist is increases the strength of the yarn increases. There is a point where the strength of the yarn reaches maximum value while increasing twist, further increasing the twist the strength decreases. (Saville. B. P, 1999)

The introduction of level of twist effects on yarn and fabric properties like strength, handle, moisture absorption, durable properties, luster, etc. (Apurba Das and R. Alagiruswamy, 2010).

(Mitsuo Matsudaira et al, 2009)

The twist is measured by counting the number of turns per unit length of yarn. Standard test method ASTM-D-1423 is used to measure the yarn twist for produced yarns (ASTM-D-1423-08).

Yarn Evenness properties

Yarn uniformity explains how the linear density of yarn i.e. weight per unit length deviates from the actual linear density required. The deviations from its actual linear densities are considered as irregularities or Faults. There are some induced irregularities like knots; splices are introduced during the yarn manufacturing process. There is another category of

irregularities are occurs due to fibers, and by machines like slubs, neps, thick and thin places (Saville. B.P, 1999)

These faults directly affects on the quality of the yarn and Fabrics.

Uster Evenness Tester 5-S400R 5.50 is used to find the yarn evenness. It works on the principle of Capacitance. The yarn to test is passed through the two parallel plates of the capacitors. The values such as U%, CV%, Neps, Thick and thin places are continuously measured electronically by Uster standard test method.

Yarn hairiness

The protruding fibers appear on the surface of the staple yarn is called hairiness.

In most of the cases the yarn hairiness is an undesirable, because it effects on the quality of the fabric, as well as in the fabric wet processing. Yarn hairiness indicates the number of protruding fibers on the surface of the yarn. The Yarn Hairiness Index can be measured in the Uster evenness tester.

Table 1: Types of Hand Spun Yarns Produced

Sl No	Yarn code	Details of Yarns	Type of spinning	Color of The Fibers
1	W1	Bellary Breed 100% Wool	Hand spinning	Natural Black
2	W2	Bellary Breed 100% wool	Hand spinning	Natural Black & White
3	W3	Hassan Breed 100% wool	Hand spinning	Natural White
4	W2PH	Bellary Breed 70% wool Polyester 30%	Hand spinning	Black & White Wool And White Polyester





Yarn Code	Yarn Description	Yarn Image
W1	Bellary Breed 100% Wool	
W2	Bellary Breed 100% wool	
W3	Hassan Breed 100% wool	
W2PH	Bellary Breed 70% wool Polyester 30%,	

Figure 5: Images of Yarn produced

RESULTS AND DISCUSSIONS

Results and discussions are made for Yarn count, Twist of yarns, Uniformity U%, Thin places, Thick places, Neps hairiness index.

Yarn count

Table 2: Yarn Counts

Sl No	Yarn Code	Mean Tex	Cv%
1	W1	396	79
2	W2	346	37
3	W3	316	61
4	W2PH	344	176

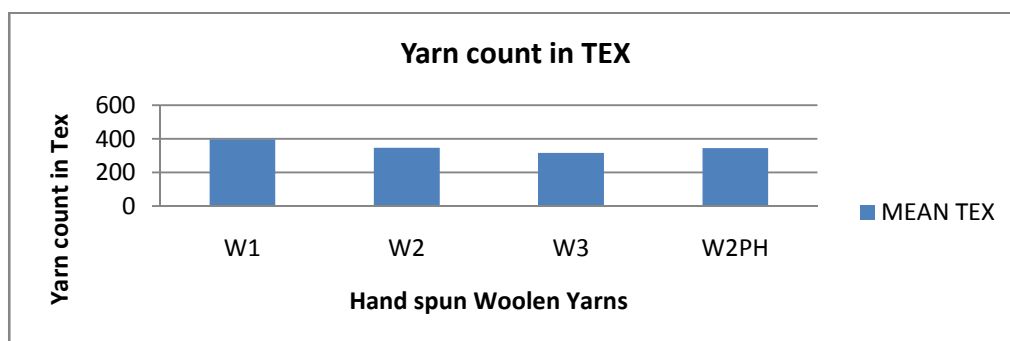


Figure 6: Yarn count

The count of the yarns produced range varies from 316 to 396 Tex. The yarn W1 courser, Yarn W3 is finer yarn. W2PH wool, polyester blended yarn has a more Coefficient of variation.

Yarn Twist

Table 3: Yarn Twist

Sl No	Code	Twist per inch (TPI)	Twist per meter (TPM)	CV%
1	W1	5.7	224.41	117
2	W2	4.3	169.29	104
3	W3	5	196.85	122
4	W2PH	4.6	181.10	119

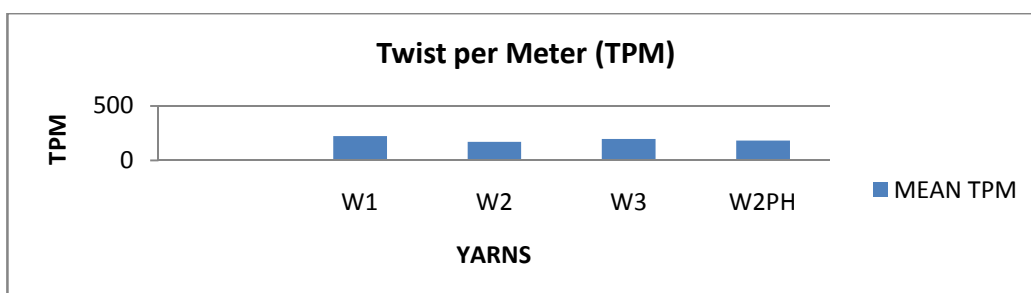


Figure 7: Yarn Twist

Twist in W1 Yarn is slightly higher comparatively than other yarns. W2 yarn having lowest twist. The coefficient of variation in a twist is not much varied for all the yarns. W2 yarn is blended with polyester to make yarn. W2 and W2PH are having almost same Twist.

Evenness properties

Evenness properties are measured on Uster Tester 5-S400r 5.50, V=50m/Min, T=0.5 Min, U% Imperfection, Thick Places, Thin Places, and Neps, Imperfections for 1000 Mts

Uniformity %

Table 4: Uniformity %

Slno	Code	Mean U%	Cv%
1	W1	23.42	29.74
2	W2	22	27.52
3	W3	19.48	24.56
4	W2PH	24.8	31.86

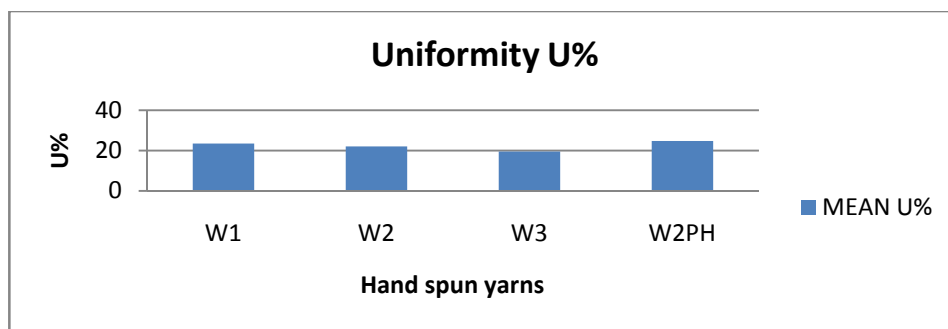


Figure 8: Uniformity U% of yarns

The W2PH yarn has more Uniformity U% compare to other yarns. W3 has less variation.

Thin Places

Table 5: Thin places

SLNO	Yarn Code	Thin -30%	Thin -40%	Thin -50%	Thin -60%
1	W1	5540	3580	1860	660
2	W2	5720	3720	1620	460
3	W3	6740	3600	1300	240
4	W2PH	6080	4120	2440	1120

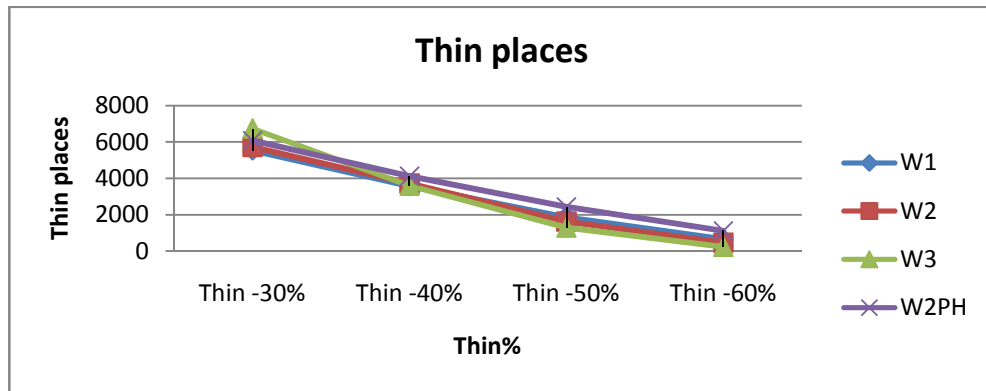


Figure 9: Thin places of yarns

The numbers of thin places occurred in within -60% are less in numbers and within -30% thin places has found more thin places. In W2PH yarns thinner places are occurring.

Thick Places

Table 6: Thick places

Sl no	Code	Thick +35%	Thick +50%	Thick +70%	Thick +100%
1	W1	3120	1340	640	160
2	W2	3000	1280	340	20
3	W3	3020	1140	320	20
4	W2PH	2980	1340	640	140

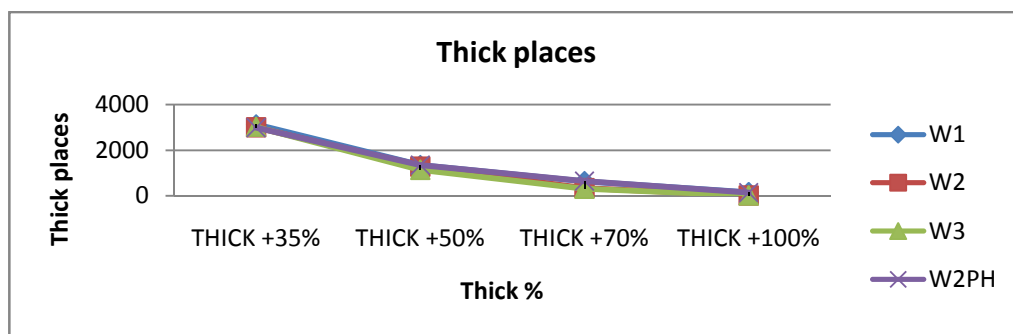


Figure 10: Thick places of yarns

More thick places are found in thicknesses of +30% thickness sizes in all the yarns. Less thick places are found in thickness of less than +100% thickness sizes in all the yarns.

Neps

Table 7: Neps

Sln	Code	Neps +140%	Neps +200%	Neps +280%	Neps +400%
1	W1	240	120	100	20
2	W2	260	60	40	0
3	W3	220	100	40	0
4	W2PH	260	40	20	20

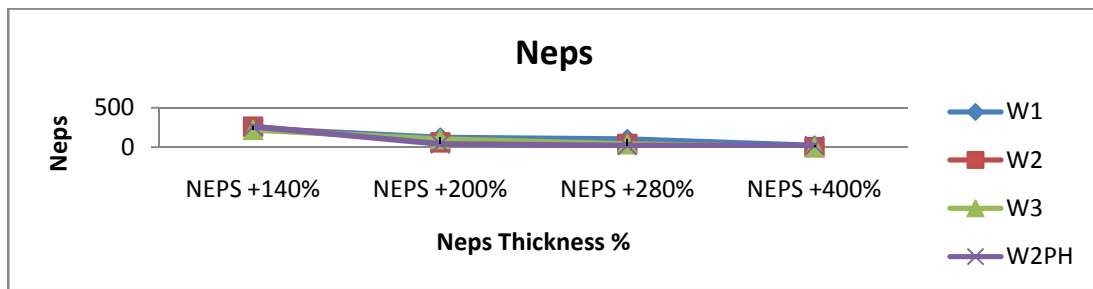


Figure 11: Neps of yarns

Neps are occurred more in all the yarns of +140% nep thicknesses, and less in +140% of nep thickness.

Hairiness

To measure the hairiness of the yarn Uster Tester 5-S400r 5.50, - Hairiness Index $V=50\text{m/Min}$, $T=0.5\text{ Min}$, is used.

Table 8: Hairiness index

Slno	Code	Hairiness. Index	Cv%
1	W1	4.47	1.93
2	W2	10.23	4.14
3	W3	15.24	5.23
4	W2PH	12.94	5.12

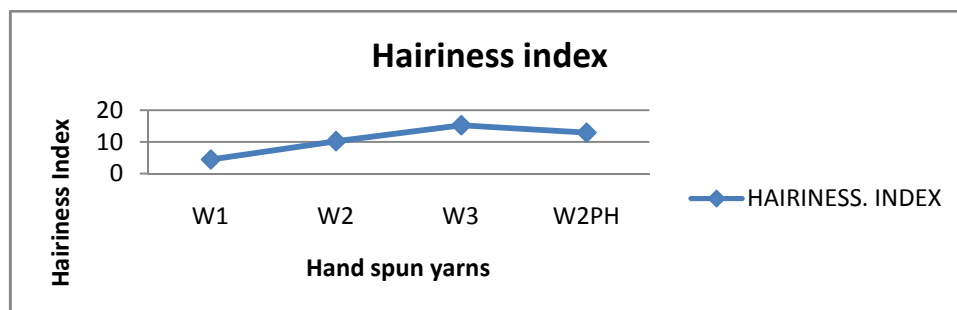


Figure 12: Hairiness index

Hairiness index is more of the W3 yarn, less for W1 yarns. CV% less for W1 yarn, it means not much variation of hairiness index observed in W1 yarn.

CONCLUSIONS

It is possible to blend the Indian courser wool with polyester fiber on hand spinning with charka. Polyester fibers can be used to produce blended yarn in the rural areas to have the advantages of getting more varieties of yarns. Rural hand spinners can also use different dyed polyester fibers for blending to get more colored yarns. Hence rural weavers can produce marketable blankets.

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